CHAPTER

11 Practice Test 3

This practice test is a simulation of the three Math sections you will complete on the SAT. To receive the most benefit from this practice test, complete it as if it were the real SAT. So take this practice test under test-like conditions: Isolate yourself somewhere you will not be disturbed; use a stopwatch; follow the directions; and give yourself only the amount of time allotted for each section.

When you are finished, review the answers and explanations that immediately follow the test. Make note of the kinds of errors you made and review the appropriate skills and concepts before taking another practice test.

▶ Section 1

1.	a	b	c	d	e
2.	a	b	c	d	e
3.	a	b	c	d	e
4.	a	b	c	d	e
5.	a	b	c	d	e
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7.	a	b	c	d	e
8.	a	b	c	d	e
9.	a	b	c	d	e
10.	a	b	c	d	e
11.	a	b	c	d	e
12.	a	b	c	d	e
13.	a	b	c	d	e
14.	a	b	c	d	e
15.	a	b	c	d	e
16.	a	b	c	d	e
17.	a	b	c	d	e
18.	a	b	c	d	e
19.	a	b	c	d	e
20.	a	b	c	d	e

▶ Section 2

1.	a	b	c	d	e
2.	a	b	c	d	e
3.	a	b	c	d	e
4.	a	b	c	d	e
5.	a	b	c	d	e
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7.	a	b	c	d	e
8.	a	b	c	d	e

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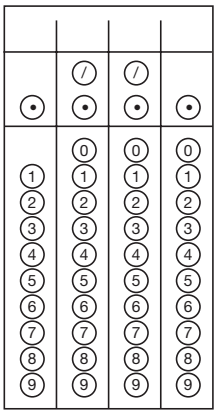

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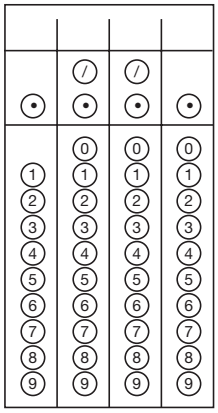

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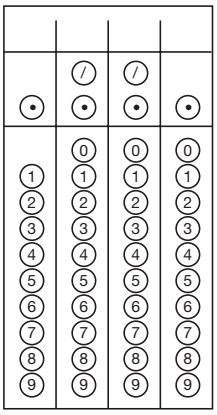

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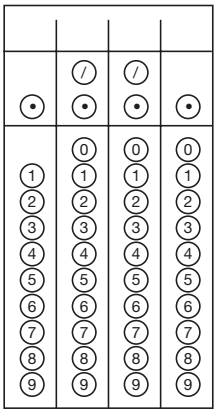

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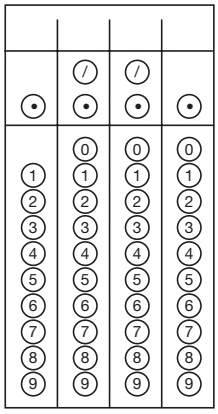

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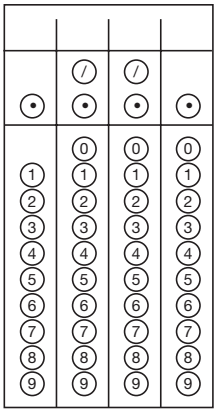

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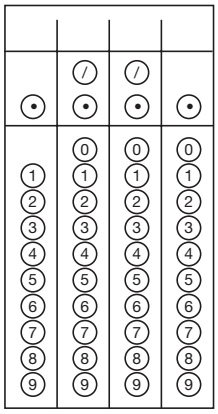

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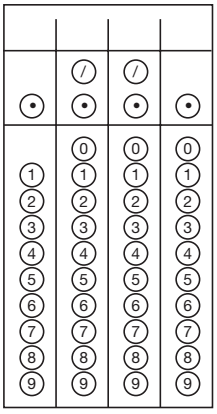

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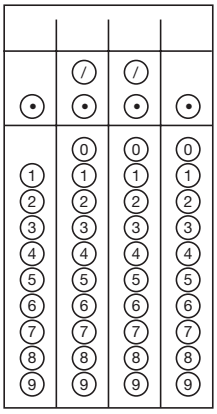

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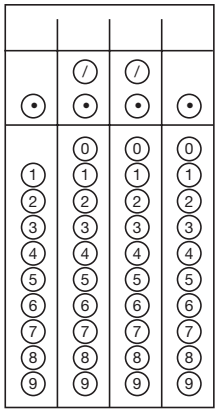

▶ Section 3

1.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
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4.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
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6.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
7.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
8.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
9.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
10.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
11.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
12.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
13.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
14.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
15.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ
16.	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ

▶ Section 1

1. Which of the following could be equal to $\frac{x}{4x}$?

a. $-\frac{1}{4}$

b. $\frac{0}{4}$

c. 0.20

d. $\frac{4}{12}$

e. $\frac{5}{20}$

2. There are seven vocalists, four guitarists, four drummers, and two bassists in Glen Oak's music program, while there are five vocalists, eight guitarists, two drummers, and three bassists in Belmont's music program. If a band comprises one vocalist, one guitarist, one drummer, and one bassist, how many more bands can be formed in Belmont?

a. 4

b. 10

c. 16

d. 18

e. 26

3. Which of the following is the equation of a parabola whose vertex is at (5,–4)?

a. $y = (x - 5)^2 - 4$

b. $y = (x + 5)^2 - 4$

c. $y = (x - 5)^2 + 4$

d. $y = (x + 5)^2 + 4$

e. $y = x^2 - 29$

4. If $b^3 = -64$, then $b^2 - 3b - 4 =$

a. –6.

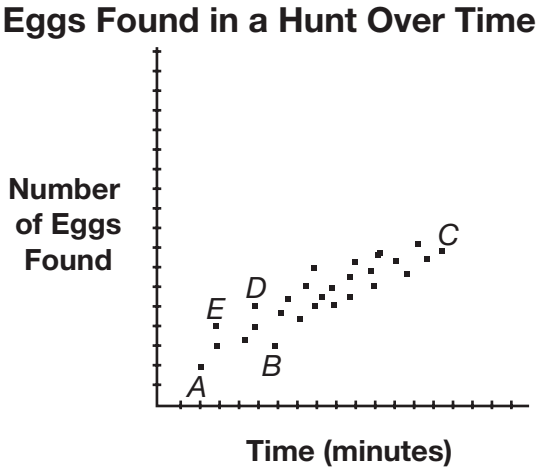
b. –4.

c. 0.

d. 24.

e. 28.

5.



The scatter plot above shows how many eggs were found in a hunt over time. Which of the labeled points represents a number of eggs found that is greater than the number of minutes that has elapsed?

a. *A*
b. *B*
c. *C*
d. *D*
e. *E*

6. The point (6, –3) could be the midpoint of which of the following lines?

a. a line with endpoints at (0,–1) and (12,–2)
b. a line with endpoints at (2,–3) and (6,1)
c. a line with endpoints at (6,0) and (6,–6)
d. a line with endpoints at (–6,3) and (–6,–3)
e. a line with endpoints at (3,3) and (12,–6)

7. A sack contains red, blue, and yellow marbles. The ratio of red marbles to blue marbles to yellow marbles is 3:4:8. If there are 24 yellow marbles in the sack, how many total marbles are in the sack?

a. 45
b. 48
c. 72
d. 96
e. 144

8. What two values are not in the domain of $y = \frac{x^2 - 36}{x^2 - 9x - 36}$?

a. –3, 12
b. 3, –12
c. –6, 6
d. –6, 36
e. 9, 36

9. The diagonal of one face of a cube measures $4\sqrt{2}$ in. What is the volume of the cube?
- **a.** $24\sqrt{2}$ in^3
- **b.** 64 in^3
- **c.** 96 in^3
- **d.** $128\sqrt{2}$ in^3
- **e.** 192 in^3

10. A line has a y-intercept of –6 and an x-intercept of 9. Which of the following is a point on the line?
- **a.** (–6,–10)
- **b.** (1,3)
- **c.** (0,9)
- **d.** (3,–8)
- **e.** (6,13)

11. If $m < n < 0$, then all of the following are true EXCEPT
- **a.** $-m < -n$.
- **b.** $mn > 0$.
- **c.** $|m| + n > 0$.
- **d.** $|n| < |m|$.
- **e.** $m - n < 0$.

12. The area of a circle is equal to four times its circumference. What is the circumference of the circle?
- **a.** π units
- **b.** 16π units
- **c.** 48π units
- **d.** 64π units
- **e.** cannot be determined

13. If the statement "All students take the bus to school" is true, then which of the following must be true?
- **a.** If Courtney does not take the bus to school, then she is not a student.
- **b.** If Courtney takes the bus to school, then she is a student.
- **c.** If Courtney is not a student, then she does not take the bus.
- **d.** all of the above
- **e.** none of the above

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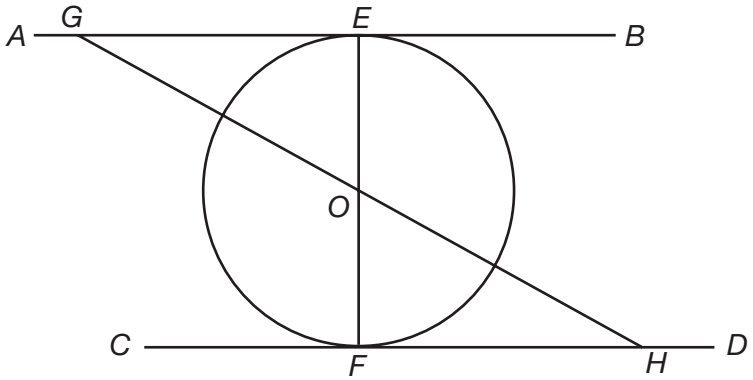
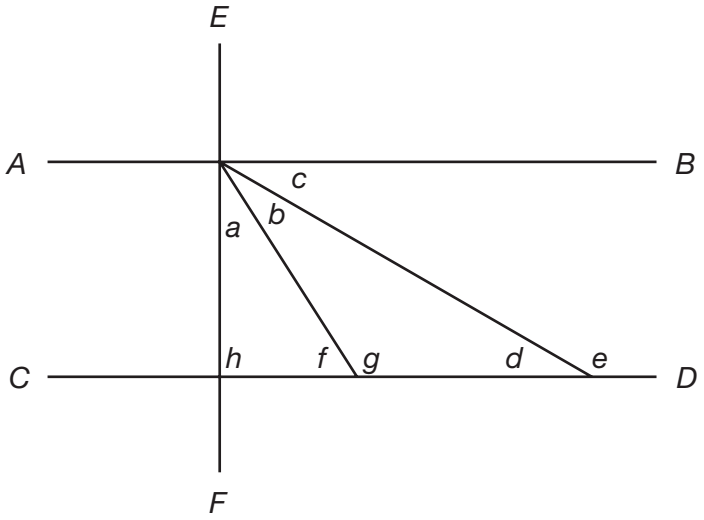


In the diagram above, line *AB* is parallel to line *CD*, both lines are tangents to circle *O* and the diameter of circle *O* is equal in measure to the length of line *OH*. If the diameter of circle *O* is 24 in, what is the measure of angle *BGH*?

a. 30 degrees
b. 45 degrees
c. 60 degrees
d. 75 degrees
e. cannot be determined

15.



In the diagram above, if line *AB* is parallel to line *CD*, and line *EF* is perpendicular to lines *AB* and *CD*, all of the following are true EXCEPT

a. $e = a + b + 90$.
b. $a + h + f = b + g + d$.
c. $a + h = g$.
d. $a + b + d = 90$.
e. $c + b = g$.

16. If the lengths of the edges of a cube are decreased by 20%, the surface area of the cube will decrease by

a. 20%.
b. 36%.
c. 40%.
d. 51%.
e. 120%.

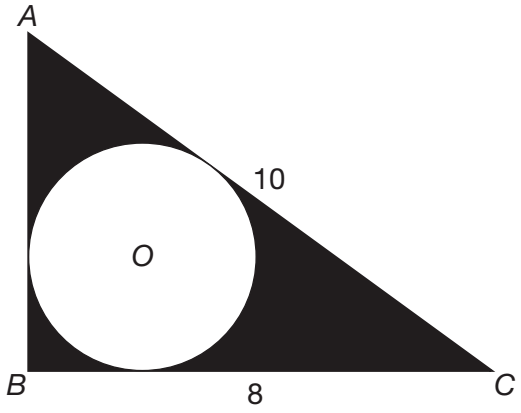
17. Simon plays a video game four times. His game scores are 18 points, 27 points, 12 points, and 15 points. How many points must Simon score in his fifth game in order for the mean, median, and mode of the five games to equal each other?

a. 12 points
b. 15 points
c. 18 points
d. 21 points
e. 27 points

18. If $g\frac{2}{5} = 16$, then $g(-\frac{1}{5}) =$

a. $\frac{1}{4}$.
b. $\frac{1}{8}$.
c. $\frac{16}{5}$.
d. 4.
e. 8.

19.



In the diagram above, triangle ABC is a right triangle and the diameter of circle O is $\frac{2}{3}$ the length of AB. Which of the following is equal to the shaded area?

a. 20π square units
b. $24 - 4\pi$ square units
c. $24 - 16\pi$ square units
d. $48 - 4\pi$ square units
e. $48 - 16\pi$ square units

20. In a restaurant, the ratio of four-person booths to two-person booths is 3:5. If 154 people can be seated in the restaurant, how many two-person booths are in the restaurant?

a. 14
b. 21
c. 35
d. 57
e. 70

▶ Section 2

1. If $y = -x^3 + 3x - 3$, what is the value of y when $x = -3$?

a. –35
b. –21
c. 15
d. 18
e. 33

2. What is the tenth term of the sequence: 5, 15, 45, 135 . . . ?

a. 5^{10}
b. $\frac{3^{10}}{5}$
c. $(5 \times 3)^9$
d. 5×3^9
e. 5×3^{10}

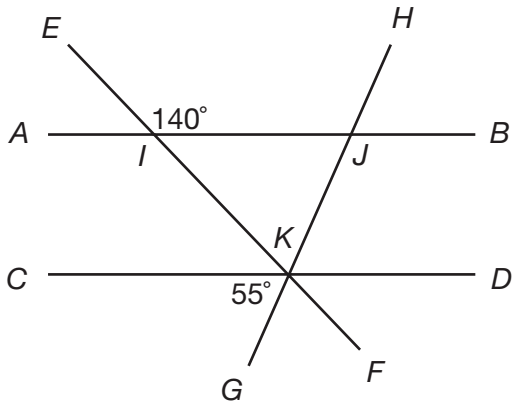
3. Wendy tutors math students after school every day for five days. Each day, she tutors twice as many students as she tutored the previous day. If she tutors t students the first day, what is the average (arithmetic mean) number of students she tutors each day over the course of the week?

a. t
b. $5t$
c. $6t$
d. $\frac{t^5}{5}$
e. $\frac{31t}{5}$

4. A pair of Jump sneakers costs $60 and a pair of Speed sneakers costs $45. For the two pairs of sneakers to be the same price

a. the price of a pair of Jump sneakers must decrease by 15%.
b. the price of a pair of Speed sneakers must increase by 15%.
c. the price of a pair of Jump sneakers must decrease by 25%.
d. the price of a pair of Speed sneakers must increase by 25%.
e. the price of a pair of Jump sneakers must decrease by 33%.

5.



In the diagram above, line *AB* is parallel to line *CD*, angle *EIJ* measures 140 degrees and angle *CKG* measures 55 degrees. What is the measure of angle *IKJ*?

a. 40 degrees
b. 55 degrees
c. 85 degrees
d. 95 degrees
e. 135 degrees

6. A number cube is labeled with the numbers one through six, with one number on each side of the cube. What is the probability of rolling either a number that is even or a number that is a factor of 9?

a. $\frac{1}{3}$
b. $\frac{1}{2}$
c. $\frac{2}{3}$
d. $\frac{5}{6}$
e. 1

7. The area of one square face of a rectangular prism is 121 square units. If the volume of the prism is 968 cubic units, what is the surface area of the prism?

a. 352 square units
b. 512 square units
c. 528 square units
d. 594 square units
e. 1,452 square units

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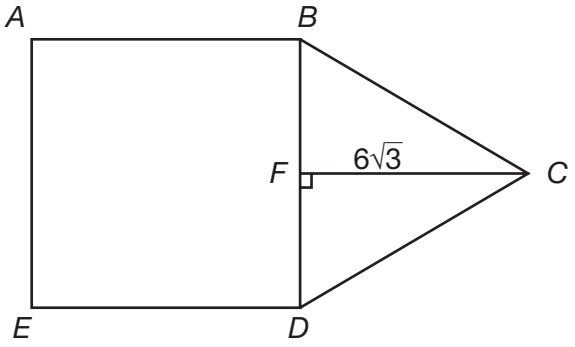


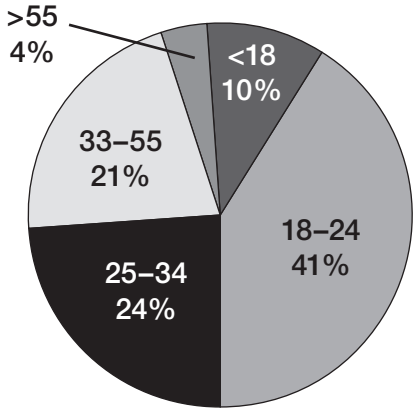
In the diagram above, *ABDE* is a square and *BCD* is an equilateral triangle. If $FC = 6\sqrt{3}$ cm, what is the perimeter of *ABCDE*?

a. $30\sqrt{3}$ cm
b. $36\sqrt{3}$ cm
c. 60 cm
d. $60\sqrt{3}$ cm
e. 84 cm

9. What is the value of $(3xy + x)\frac{x}{y}$ when $x = 2$ and $y = 5$?

10.

Ages of Spring Island Concert Attendees



The diagram above shows the breakdown by age of the 1,560 people who attended the Spring Island Concert last weekend. How many people between the ages of 18 and 34 attended the concert?

11. Matt weighs $\frac{3}{5}$ of Paul's weight. If Matt were to gain 4.8 pounds, he would weigh $\frac{2}{3}$ of Paul's weight. What is Matt's weight in pounds?

12. If $-6b + 2a - 25 = 5$ and $\frac{a}{b} + 6 = 4$, what is the value of $(\frac{b}{a})^2$?

13. The function $j@k = (\frac{j}{k})^j$. If $j@k = -8$ when $j = -3$, what is the value of k?

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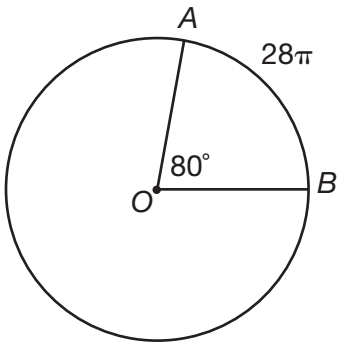

In the circle above, the measure of angle *AOB* is 80 degrees and the length of arc *AB* is 28π units. What is the radius of the circle?

15. What is the distance from the point where the line given by the equation $3y = 4x + 24$ crosses the *x*-axis to the point where the line crosses the *y*-axis?

16. For any whole number $x > 0$, how many elements are in the set that contains only the numbers that are multiples AND factors of *x*?

17. A bus holds 68 people. If there must be one adult for every four children on the bus, how many children can fit on the bus?

18. In Marie's fish tank, the ratio of guppies to platies is 4:5. She adds nine guppies to her fish tank and the ratio of guppies to platies becomes 5:4. How many guppies are in the fish tank now?

▶ Section 3

1. The line $y = -2x + 8$ is
- **a.** parallel to the line $y = \frac{1}{2}x + 8$.
- **b.** parallel to the line $\frac{1}{2}y = -x + 3$.
- **c.** perpendicular to the line $2y = -\frac{1}{2}x + 8$.
- **d.** perpendicular to the line $\frac{1}{2}y = -2x - 8$.
- **e.** perpendicular to the line $y = 2x - 8$.

2. It takes six people eight hours to stuff 10,000 envelopes. How many people would be required to do the job in three hours?
- **a.** 4
- **b.** 12
- **c.** 16
- **d.** 18
- **e.** 24

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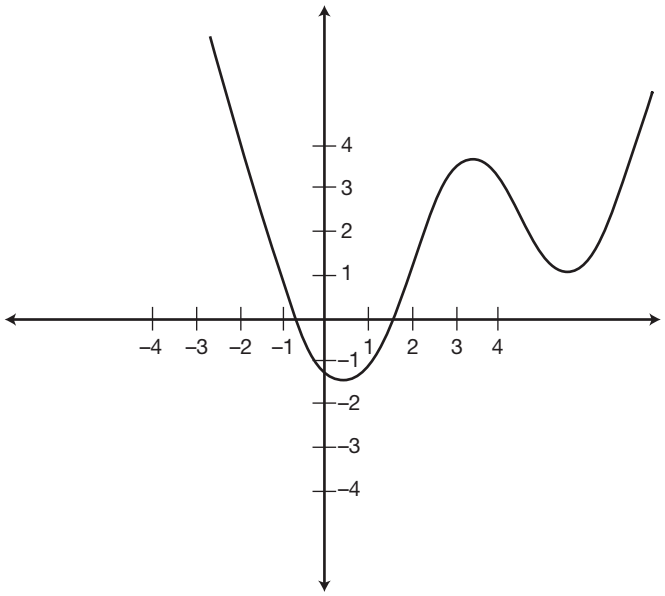


In the diagram above of $f(x)$, for how many values does $f(x) = -1$?

a. 0
b. 1
c. 2
d. 3
e. 4

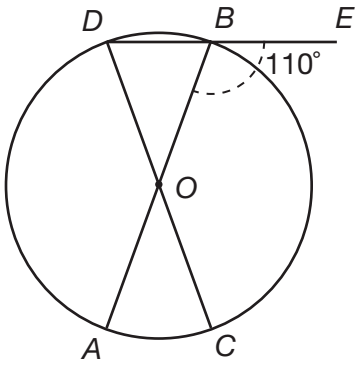
4. The equation $\frac{x^2}{4} - 3x = -8$ when $x =$

a. –8 or 8.
b. –4 or 4.
c. –4 or –8.
d. 4 or –8.
e. 4 or 8.

5. The expression $\frac{x^2 - 16}{x^3 + x^2 - 20x}$ can be reduced to

a. $\frac{4}{x+5}$.
b. $\frac{x+4}{x}$.
c. $\frac{x+4}{x+5}$.
d. $\frac{x+4}{x^2+5x}$.
e. $-\frac{16}{x3-20x}$.

6.



In the diagram above, if angle *OBE* measures 110 degrees, what is the measure of arc *AC*?

a. 20 degrees
b. 40 degrees
c. 55 degrees
d. 80 degrees
e. cannot be determined

7. The volume of a cylinder is 486π cubic units. If the height of the cylinder is six units, what is the total area of the bases of the cylinder?

a. 9π square units
b. 18π square units
c. 27π square units
d. 81π square units
e. 162π square units

8. If $a\sqrt{20} = \frac{2\sqrt{180}}{a}$, then $a =$

a. $2\sqrt{3}$.
b. $\sqrt{5}$.
c. 5.
d. $\sqrt{6}$.
e. 6.

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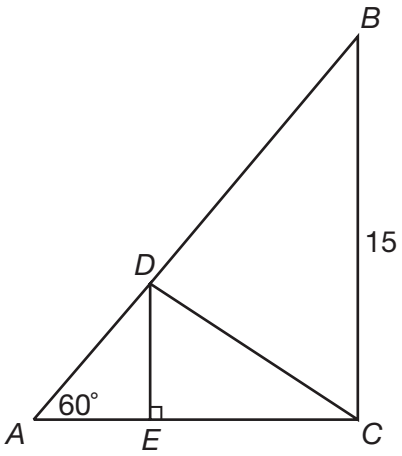

In the diagram above, *ABC* and *DEC* are right triangles, the length of side *BC* is 15 units, and the measure of angle *A* is 60 degrees. If angle *A* is congruent to angle *EDC*, what is the length of side *DC*?

a. $\sqrt{15}$ units

b. $\frac{15}{2}$ units

c. $\frac{15}{2}\sqrt{3}$ units

d. 9 units

e. $15\sqrt{3}$ units

10. If q is decreased by p percent, then the value of q is now

a. $q - p$.

b. $q - \frac{p}{100}$.

c. $-\frac{pq}{100}$.

d. $q - \frac{pq}{100}$.

e. $pq - \frac{pq}{100}$.

11. The product of $(\frac{a}{b})^2(\frac{b}{a})^{-2}(\frac{1}{a})^{-1} =$

a. a.

b. $\frac{1}{a}$.

c. $\frac{a^3}{b^4}$.

d. $\frac{a^4}{b^4}$.

e. $\frac{a^5}{b^4}$.

12. Gil drives five times farther in 40 minutes than Warrick drives in 30 minutes. If Gil drives 45 miles per hour, how fast does Warrick drive?

a. 6 mph
b. 9 mph
c. 12 mph
d. 15 mph
e. 30 mph

13. A bank contains one penny, two quarters, four nickels, and three dimes. What is the probability of selecting a coin that is worth more than five cents but less than 30 cents?

a. $\frac{1}{5}$
b. $\frac{1}{4}$
c. $\frac{1}{2}$
d. $\frac{7}{10}$
e. $\frac{9}{10}$

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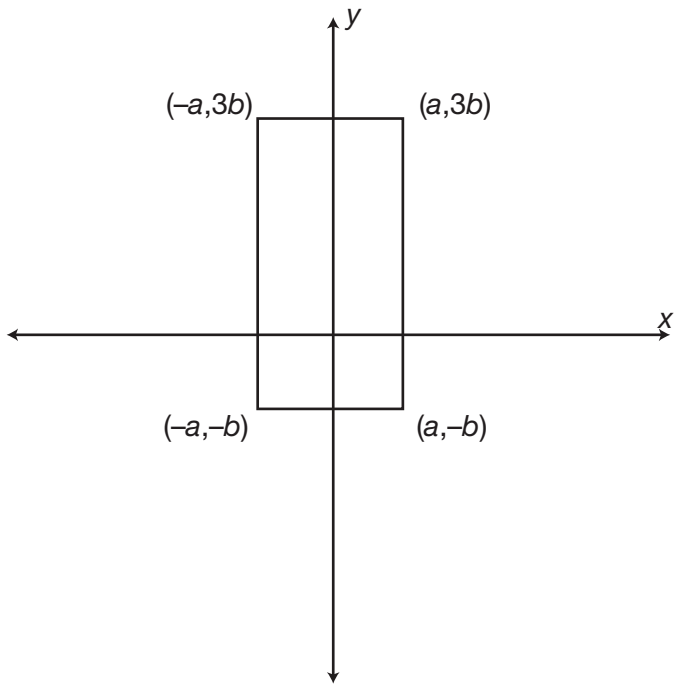


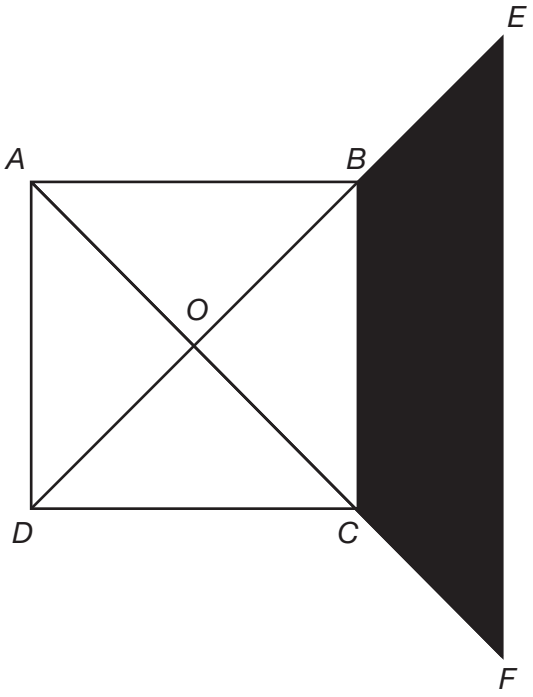
In the diagram above, what is the area of the rectangle?

a. $6ab$ square units
b. $8ab$ square units
c. $9b^2$ square units
d. $12ab$ square units
e. $16b$ square units

15. If set *M* contains only the positive factors of 8 and set *N* contains only the positive factors of 16, then the union of sets *M* and *N*

a. contains exactly the same elements that are in set *N*.
b. contains only the elements that are in both sets *M* and *N*.
c. contains nine elements.
d. contains four elements.
e. contains only even elements.

16.



In the diagram above, *ABCD* is a square with an area of 100 cm^2 and lines *BD* and *AC* are the diagonals of *ABCD*. If line *EF* is parallel to line *BC* and the length of line $CF = 3\sqrt{2}$ cm, which of the following is equal to the shaded area?

a. 25 cm^2
b. 39 cm^2
c. 64 cm^2
d. 78 cm^2
e. 89 cm^2

▶ Answer Key

Section 1 Answers

1. e. Divide the numerator and denominator of $\frac{x}{4x}$ by x, leaving $\frac{1}{4}$. Divide the numerator and denominator of $\frac{5}{20}$ by 5. This fraction is also equal to $\frac{1}{4}$.

2. c. Multiply the numbers of vocalists, guitarists, drummers, and bassists in each town to find the number of bands that can be formed in each town. There are (7)(4)(4)(2) = 224 bands that can be formed in Glen Oak. There are (5)(8)(2)(3) = 240 bands that can be formed in Belmont; 240 – 224 = 16 more bands that can be formed in Belmont.

3. a. The equation of a parabola with its turning point five units to the right of the y-axis is written as $y = (x-5)^2$. The equation of a parabola with its turning point four units below the x-axis is written as $y = x^2 - 4$. Therefore, the equation of a parabola with its vertex at (5,–4) is $y = (x-5)^2 - 4$.

4. d. If $b^3 = -64$, then, taking the cube root of both sides, $b = -4$. Substitute –4 for b in the second equation: $b^2 - 3b - 4 = (-4)^2 - 3(-4) - 4 = 16 + 12 - 4 = 24$.

5. e. The point that represents a number of eggs found that is greater than the number of minutes that has elapsed is the point that has a y value that is greater than its x value. Only point E lies farther from the horizontal axis than it lies from the vertical axis. At point E, more eggs have been found than the number of minutes that has elapsed.

6. c. The midpoint of a line is equal to the average of the x-coordinates and the average of the y-coordinates of the endpoints of the line. The midpoint of the line with endpoints at (6,0) and (6,–6) is $(\frac{6+6}{2}, \frac{0+-6}{2}) = (\frac{12}{2}, \frac{-6}{2}) = (6,-3)$.

7. a. The number of yellow marbles, 24, is $\frac{24}{8} = 3$ times larger than the number of marbles given in the ratio. Multiply each number in the ratio by 3 to find the number of each color of marbles. There are 3(3) = 9 red marbles and 4(3) = 12 blue marbles. The total number of marbles in the sack is 24 + 9 + 12 = 45.

8. a. The equation $y = \frac{x^2-36}{x^2-9x-36}$ is undefined when its denominator, $x^2 - 9x - 36$, evaluates to zero. The x values that make the denominator evaluate to zero are not in the domain of the equation. Factor $x^2 - 9x - 36$ and set the factors equal to zero: $x^2 - 9x - 36 = (x-12)(x+3)$; $x - 12 = 0$, $x = 12$; $x + 3 = 0$, $x = -3$.

9. b. Every face of a cube is a square. The diagonal of a square is equal to $s\sqrt{2}$, where s is the length of a side of the square. If $s\sqrt{2} = 4\sqrt{2}$, then one side, or edge, of the cube is equal to 4 in. The volume of a cube is equal to e^3, where e is the length of an edge of the cube. The volume of the cube is equal to $(4 \text{ in})^3 = 64 \text{ in}^3$.

10. a. A line with a y-intercept of –6 passes through the point (0,–6) and a line with an x-intercept of 9 passes through the point (9,0). The slope of a line is equal to the change in y values between two points on the line divided by the change in the x values of those points. The slope of this line is equal to $\frac{0-(-6)}{9-0} = \frac{6}{9} = \frac{2}{3}$. The equation of the line that has a slope of $\frac{2}{3}$ and a y-intercept of –6 is $y = \frac{2}{3}x - 6$. When $x = -6$, y is equal to $\frac{2}{3}(-6) - 6 = -4 - 6 = -10$; therefore, the point (–6,–10) is on the line $y = \frac{2}{3}x - 6$.

11. a. If $m < n < 0$, then m and n are both negative numbers, and m is more negative than n. Therefore, $-m$ will be more positive (greater) than $-n$, so the statement $-m < -n$ cannot be true.

12. b. If r is the radius of this circle, then the area of this circle, πr^2, is equal to four times its circumference, $2\pi r$: $\pi r^2 = 4(2\pi r)$, $\pi r^2 = 8\pi r$, $r^2 = 8r$, $r = 8$ units. If the radius of the circle is eight units, then its circumference is equal to $2\pi(8) = 16\pi$ units.

13. a. Since all students take the bus to school, anyone who does not take the bus cannot be a student. If Courtney does not take the bus to school, then she cannot be a student. However, it is not

necessarily true that everyone who takes the bus to school is a student, nor is it necessarily true that everyone who is not a student does not take the bus. The statement "All students take the bus to school" does not, for instance, preclude the statement "Some teachers take the bus to school" from being true.

14. a. Lines *OF* and *OE* are radii of circle *O* and since a tangent and a radius form a right angle, triangles *OFH* and *OGE* are right triangles. If the length of the diameter of the circle is 24 in, then the length of the radius is 12 in. The sine of angle *OHF* is equal to $\frac{12}{24}$, or $\frac{1}{2}$. The measure of an angle with a sine of $\frac{1}{2}$ is 30 degrees. Therefore, angle *OHF* measures 30 degrees. Since angles *BGH* and *OHF* are alternating angles, they are equal in measure. Therefore, angle *BGH* also measures 30 degrees.

15. e. Since *AB* and *CD* are parallel lines cut by a transversal, angle *f* is equal to the sum of angles *c* and *b*. However, angle *f* and angle *g* are not equal—they are supplementary. Therefore, the sum of angles *c* and *b* is also supplementary—and not equal—to *g*.

16. b. The surface area of a cube is equal to $6e^2$, where *e* is the length of an edge of a cube. The surface area of a cube with an edge equal to one unit is 6 cubic units. If the lengths of the edges are decreased by 20%, then the surface area becomes $6(\frac{4}{5})^2 = \frac{96}{25}$ cubic units, a decrease of $\frac{6-\frac{96}{25}}{6} = \frac{\frac{54}{25}}{6}$ $= \frac{9}{25} = \frac{36}{100} = 36\%$.

17. c. For the median and mode to equal each other, the fifth score must be the same as one of the first four, and, it must fall in the middle position when the five scores are ordered. Therefore, Simon must have scored either 15 or 18 points in his fifth game. If he scored 15 points, then his mean score would have been greater than 15: 17.4. Simon scored 18 points in his fifth game, making the mean, median, and mode for the five games equal to 18.

18. a. To go from $g(\frac{2}{5})$ to $g(-\frac{1}{5})$, you would multiply the exponent of $g(\frac{2}{5})$ by $(-\frac{1}{2})$. Therefore, to go from 16 (the value of $g(\frac{2}{5})$) to the value of $g(-\frac{1}{5})$, multiply the exponent of 16 by $(-\frac{1}{2})$. The exponent of 16 is one, so the value of $g(-\frac{1}{5}) = 16$ to the $(-\frac{1}{2})$ power, which is $\frac{1}{4}$.

19. b. Since *ABC* is a right triangle, the sum of the squares of its legs is equal to the square of the hypotenuse: $(AB)^2 + 8^2 = 10^2$, $(AB)^2 + 64 = 100$, $(AB)^2 = 36$, $AB = 6$ units. The diameter of circle *O* is $\frac{2}{3}$ of *AB*, or $\frac{2}{3}(6) = 4$ units. The area of a triangle is equal to $\frac{1}{2}bh$, where *b* is the base of the triangle and *h* is the height of the triangle. The area of $ABC = \frac{1}{2}(6)(8) = 24$ square units. The area of a circle is equal to πr^2, where *r* is the radius of the circle. The radius of a circle is equal to half the diameter of the circle, so the radius of *O* is $\frac{1}{2}(4) = 2$ units. The area of circle $O = \pi(2)^2 = 4\pi$. The shaded area is equal to the area of the triangle minus the area of the circle: $24 - 4\pi$ square units.

20. c. Let $3x$ equal the number of four-person booths and let $5x$ equal the number of two-person booths. Each four-person booth holds four people and each two-person booth holds two people. Therefore, $(3x)(4) + (5x)(2) = 154$, $12x + 10x = 154$, $22x = 154$, $x = 7$. There are $(7)(3) = 21$ four-person booths and $(7)(5) = 35$ two-person booths.

Section 2 Answers

1. c. Substitute –3 for *x* and solve for *y*:

$y = -(-3)^3 + 3(-3) - 3$

$y = -(-27) - 9 - 3$

$y = 27 - 12$

$y = 15$

2. d. The first term in the sequence is equal to 5×3^0, the second term is equal to 5×3^1, and so on. Each term in the pattern is equal to $5 \times 3^{(n-1)}$, where n is the position of the term in the pattern. The tenth term in the pattern is equal to $5 \times 3^{(10-1)}$, or 5×3^9.

3. e. If Wendy tutors t students the first day, then she tutors $2t$ students the second day, $4t$ students the third day, $8t$ students the fourth day, and $16t$ students the fifth day. The average number of students tutored each day over the course of the week is equal to the sum of the tutored students divided by the number of days: $\frac{t+2t+4t+8t+16t}{5} = \frac{31t}{5}$.

4. c. Jump sneakers cost \$60 – \$45 = \$15 more, or $\frac{15}{45}$ = 33% more than Speed sneakers. Speed sneakers cost \$15 less, or $\frac{15}{60}$ = 25% less than Jump sneakers. For the two pairs of sneakers to be the same price, either the price of Speed sneakers must increase by 33% or the price of Jump sneakers must decrease by 25%.

5. c. Since *AB* and *CD* are parallel lines cut by transversals *EF* and *GH* respectively, angles *CKG* and *IJK* are alternating angles. Alternating angles are equal in measure, so angle *IJK* = 55 degrees. Angles *EIJ* and *JIK* form a line. They are supplementary and their measures sum to 180 degrees. Angle *JIK* = 180 – 140 = 40 degrees. Angles *JIK*, *IJK*, and *IKJ* comprise a triangle. There are 180 degrees in a triangle; therefore, the measure of angle *IKJ* = 180 – (55 + 40) = 85 degrees.

6. d. There are three numbers on the cube that are even (2, 4, 6), so the probability of rolling an even number is $\frac{1}{2}$. There are two numbers on the cube that are factors of 9 (1, 3), so the probability of rolling a factor of 9 is $\frac{2}{6}$ or $\frac{1}{3}$. No numbers are members of both sets, so to find the probability of rolling either a number that is even or a number that is a factor of 9, add the probability of each event: $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$.

7. d. The area of a square is equal to the length of a side, or edge, of the square times itself. If the area of a square face is 121 square units, then the lengths of two edges of the prism are 11 units. The volume of the prism is 968 cubic units. The volume of prism is equal to *lwh*, where *l* is the length of the prism, *w* is the width of the prism, and *h* is the height of the prism. The length and width of the prism are both 11 units. The height is equal to: 968 = (11)(11)*h*, 968 = 121*h*, *h* = 8. The prism has two square faces and four rectangular faces. The area of one square face is 121 square units. The area of one rectangular face is (8)(11) = 88 square units. Therefore, the total surface area of the prism is equal to: 2(121) + 4(88) = 242 + 352 = 594 square units.

8. c. Since *BCD* is an equilateral triangle, angles *CBD*, *BDC*, and *BCD* all measure 60 degrees. *FCD* and *BCF* are both 30-60-90 right triangles that are congruent to each other. The side opposite the 60-degree angle of triangle *BCF*, side *FC*, is equal to $\sqrt{3}$ times the length of the side opposite the 30-degree angle, side *BF*. Therefore, *BF* is equal to = 6 cm. The hypotenuse, *BC*, is equal to twice the length of side *BF*. The length of *BC* is 2(6) = 12 cm. Since *BC* = 12 cm, *CD* and *BD* are also 12 cm. *BD* is one side of square *ABDE*; therefore, each side of *ABDE* is equal to 12 cm. The perimeter of *ABCDE* = 12 cm + 12 cm + 12 cm + 12 cm + 12 cm = 60 cm.

9. 4 Substitute 2 for x and 5 for y: $(3xy + x)^{\frac{x}{y}} = ((3)(2)(5) + 2)^{\frac{2}{5}} = (30 + 2)^{\frac{2}{5}} = 32^{\frac{2}{5}} = (\sqrt[5]{32})^2 = 2^2 = 4$. Or, 3(2)(5) = 30, 30 + 2 = 32, the 5th root of 32 is 2, 2 raised to the 2nd power is 4.

10. **1,014** Of the concert attendees, 41% were between the ages of 18–24 and 24% were between the ages of 25–34. Therefore, 41 + 24 = 65% of the attendees, or (1,560)(0.65) = 1,014 people between the ages of 18 and 34 attended the concert.

11. **43.2** Matt's weight, m, is equal to $\frac{3}{5}$ of Paul's weight, p: $m = \frac{3}{5}p$. If 4.8 is added to m, the sum is equal to $\frac{2}{3}$ of p: $m + 4.8 = \frac{2}{3}p$. Substitute the value of m in terms of p into the second equation: $\frac{3}{5}p + 4.8 = \frac{2}{3}p$, $\frac{1}{15}p = 4.8$, $p = 72$. Paul weighs 72 pounds, and Matt weighs $\frac{3}{5}(72) = 43.2$ pounds.

12. $\frac{1}{4}$ Solve $-6b + 2a - 25 = 5$ for a in terms of b: $-6b + 2a - 25 = 5$, $-3b + a = 15$, $a = 15 + 3b$. Substitute a in terms of b into the second equation: $\frac{15+3b}{b} + 6 = 4$, $\frac{15}{b} + 3 + 6 = 4$, $\frac{15}{b} = -5$, $b = -3$. Substitute b into the first equation to find the value of a: $-6b + 2a - 25 = 5$, $-6(-3) + 2a - 25 = 5$, $18 + 2a = 30$, $2a = 12$, $a = 6$. Finally, $(\frac{b}{a})^2 = (\frac{-3}{6})^2 = (-\frac{1}{2})^2 = \frac{1}{4}$.

13. **6** If $j@k = -8$ when $j = -3$, then:

$-8 = (\frac{-3}{k})^{-3}$

$-8 = (\frac{k}{-3})^3$

$-8 = -\frac{k^3}{27}$

$216 = k^3$

$k = 6$

14. **63** The size of an intercepted arc is equal to the measure of the intercepting angle divided by 360, multiplied by the circumference of the circle ($2\pi r$, where r is the radius of the circle): $28\pi = (\frac{80}{360})(2\pi r)$, $28 = (\frac{4}{9})r$, $r = 63$ units.

15. **10** Write the equation in slope-intercept form ($y = mx + b$): $3y = 4x + 24$, $y = \frac{4}{3}x + 8$. The line crosses the y-axis at its y-intercept, (0,8). The line crosses the x-axis when $y = 0$: $\frac{4}{3}x + 8 = 0$, $\frac{4}{3}x = -8$, $x = -6$. Use the distance formula to find the distance from (0,8) to (–6,0):

Distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Distance = $\sqrt{((-6) - 0)^2 + (0 - 8)^2}$

Distance = $\sqrt{6^2 + (-8)^2}$

Distance = $\sqrt{36 + 64}$

Distance = $\sqrt{100}$

Distance = 10 units.

16. **1** The largest factor of a positive, whole number is itself, and the smallest multiple of a positive, whole number is itself. Therefore, the set of only the factors and multiples of a positive, whole number contains one element—the number itself.

17. **52** There is one adult for every four children on the bus. Divide the size of the bus, 68, by 5: $\frac{68}{5} = 13.6$. There can be no more than 13 groups of one adult, four children. Therefore, there can be no more than (13 groups)(4 children in a group) = 52 children on the bus.

18. **25** If the original ratio of guppies, g, to platies, p, is 4:5, then $g = \frac{4}{5}p$. If nine guppies are added, then the new number of guppies, $g + 9$, is equal to $\frac{5}{4}p$: $g + 9 = \frac{5}{4}p$. Substitute the value of g in terms of p from the first equation: $\frac{4}{5}p + 9 = \frac{5}{4}p$, $9 = \frac{9}{20}p$, $p = 20$. There are 20 platies in the fish tank and there are now $20(\frac{5}{4}) = 25$ guppies in the fish tank. $\frac{6\sqrt{3}}{\sqrt{3}}$

Section 3 Answers

1. **b.** Parallel lines have the same slope. When an equation is written in the form $y = mx + b$, the value of m (the coefficient of x) is the slope. The line $y = -2x + 8$ has a slope of –2. The line $\frac{1}{2}y = -x + 3$ is equal to $y = -2x + 6$. This line has the same slope as the line $y = -2x + 8$; therefore, these lines are parallel.

2. **c.** Six people working eight hours produce (6)(8) = 48 work-hours. The number of people required to produce 48 work-hours in three hours is $\frac{48}{3} = 16$.

3. c. The function $f(x)$ is equal to –1 every time the graph of $f(x)$ crosses the line $y = -1$. The graph of $f(x)$ crosses $y = -1$ twice; therefore, there are two values for which $f(x) = -1$.

4. e. Write the equation in quadratic form and find its roots:

$\frac{x^2}{4} - 3x = -8$

$x^2 - 12x = -32$

$x^2 - 12x + 32 = 0$

$(x - 8)(x - 4) = 0$

$x - 8 = 0, x = 8$

$x - 4 = 0, x = 4$

$\frac{x^2}{4} - 3x = -8$ when x is either 4 or 8.

5. d. Factor the numerator and denominator; $x^2 - 16 = (x + 4)(x - 4)$ and $x^3 + x^2 - 20x = x(x + 5)(x - 4)$. Cancel the $(x - 4)$ terms that appear in the numerator and denominator. The fraction becomes $\frac{x+4}{x(x+5)}$, or $\frac{x+4}{x^2+5x}$.

6. b. Angles *OBE* and *DBO* form a line. Since there are 180 degrees in a line, the measure of angle *DBO* is 180 – 110 = 70 degrees. *OB* and *DO* are radii, which makes triangle *DBO* isosceles, and angles *ODB* and *DBO* congruent. Since *DBO* is 70 degrees, *ODB* is also 70 degrees, and *DOB* is 180 – (70 + 70) = 180 – 140 = 40 degrees. Angles *DOB* and *AOC* are vertical angles, so the measure of angle *AOC* is also 40 degrees. Angle *AOC* is a central angle, so its intercepted arc, *AC*, also measures 40 degrees.

7. e. The volume of a cylinder is equal to $\pi r^2 h$, where r is the radius of the cylinder and h is the height of the cylinder. If the height of a cylinder with a volume of 486π cubic units is six units, then the radius is equal to:

$486\pi = \pi r^2(6)$

$486 = 6r^2$

$81 = r^2$

$r = 9$

A cylinder has two circular bases. The area of a circle is equal to πr^2, so the total area of the bases of the cylinder is equal to $2\pi r^2$, or $2\pi(9)^2 = 2(81)\pi = 162\pi$ square units.

8. d. Cross multiply:

$a\sqrt{20} = \frac{2\sqrt{180}}{a}$

$a^2\sqrt{20} = 2\sqrt{180}$

$a^2\sqrt{4}\sqrt{5} = 2\sqrt{36}\sqrt{5}$

$2a^2\sqrt{5} = 12\sqrt{5}$

$a^2 = 6$

$a = \sqrt{6}$

9. b. Since triangle *DEC* is a right triangle, triangle *AED* is also a right triangle, with a right angle at *AED*. There are 180 degrees in a triangle, so the measure of angle *ADE* is 180 – (60 + 90) = 30 degrees. Angle *A* and angle *EDC* are congruent, so angle *EDC* is also 60 degrees. Since there are 180 degrees in a line, angle *BDC* must be 90 degrees, making triangle *BDC* a right triangle. Triangle *ABC* is a right triangle with angle *A* measuring 60 degrees, which means that angle *B* must be 30 degrees, and *BDC* must be a 30-60-90 right triangle. The leg opposite the 30-degree angle in a 30-60-90 right triangle is half the length of the hypotenuse. Therefore, the length of *DC* is $\frac{15}{2}$ units.

10. d. p percent of q is equal to $q(\frac{p}{100})$, or $\frac{pq}{100}$. If q is decreased by this amount, then the value of q is $\frac{pq}{100}$ less than q, or $q - \frac{pq}{100}$.

11. e. A fraction with a negative exponent can be rewritten as a fraction with a positive exponent by switching the numerator with the denominator.

$(\frac{a}{b})^2(\frac{b}{a})^{-2}(\frac{1}{a})^{-1} = (\frac{a}{b})^2(\frac{a}{b})^2(\frac{a}{1})^1 = (\frac{a^2}{b^2})(\frac{a^2}{b^2})(a) = \frac{a^5}{b^4}$.

12. c. If d is the distance Warrick drives and s is the speed Warrick drives, then $30s = d$. Gil drives five times farther, $5d$, in 40 minutes, traveling 45 miles per hour: $5d = (40)(45)$. Substitute the value of d in terms of s into the second equation and solve for s, Warrick's speed: $5(30s) = (40)(45)$, $150s = 1{,}800$, $s = 12$. Warrick drives 12 mph.

13. c. There are ten coins in the bank (1 penny + 2 quarters + 4 nickels + 3 dimes). The two quarters and three dimes are each worth more than five cents but less than 30 cents, so the probability of selecting one of these coins is $\frac{5}{10}$ or $\frac{1}{2}$.

14. b. The y-axis divides the rectangle in half. Half of the width of the rectangle is a units to the left of the y-axis and the other half is a units to the right of the y-axis. Therefore, the width of the rectangle is $2a$ units. The length of the rectangle stretches from $3b$ units above the x-axis to b units below the x-axis. Therefore, the length of the rectangle is $4b$ units. The area of a rectangle is equal to lw, where l is the length of the rectangle and w is the width of the rectangle. The area of this rectangle is equal to $(2a)(4b) = 8ab$ square units.

15. a. Set M contains the positive factors of 8: 1, 2, 4, and 8. Set N contains the positive factors of 16: 1, 2, 4, 8, and 16. The union of these sets is equal to all of the elements that are in either set. Since every element in set M is in set N, the union of N and M is the same as set N: {1, 2, 4, 8, 16}.

16. b. The area of a square is equal to s^2, where s is the length of one side of the square. A square with an area of 100 cm^2 has sides that are each equal to $\sqrt{100} = 10$ cm. The diagonal of a square is equal to $\sqrt{2}$ times the length of a side of the square. Therefore, the lengths of diagonals AC and BD are $10\sqrt{2}$ cm. Diagonals of a square bisect each other at right angles, so the lengths of segments OB and OC are each $5\sqrt{2}$ cm. Since lines BC and EF are parallel and lines OC and OB are congruent, lines BE and CF are also congruent. The length of line OF is equal to the length of line OC plus the length of line CF: $5\sqrt{2} + 3\sqrt{2} = 8\sqrt{2}$ cm. In the same way, $OE = OB + BE = 5\sqrt{2} + 3\sqrt{2} = 8\sqrt{2}$ cm. The area of a triangle is equal to $\frac{1}{2}bh$, where b is the base of the triangle and h is the height of the triangle. EOF is a right triangle, and its area is equal to $\frac{1}{2}(8\sqrt{2})(8\sqrt{2}) = \frac{1}{2}(64)(2) = 64$ cm^2. The size of the shaded area is equal to the area of EOF minus one-fourth of the area of $ABCD$: $64 - \frac{1}{4}(100) = 64 - 25 = 39$ cm^2.